IDENTIFICATION AND EVALUATION OF MISTLETOE (*Viscum album*) FOR RUMINANT FEEDING FROM SEMI-ARID BROWSES

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ABSTRACT

The research was conducted to identify and evaluate anti-nutritional content of mistletoe Viscum album for ruminant animal feeding, in Jigawa State, Nigeria. Lies between Coordinate, 12.2280^{o}N, 9.5616^{o}E. The range of annual temperature and humidity is about 19-35^{0}C (max 42 ^{0}C) in the wet season and 13-33 ^{0}C (min 10 ^{0}C) in the dry season. Mistletoe samples were collected from five Multi-Purpose Tree Species (MPTS) from Nine (9) Local Government Areas of Jigawa State, making 45 samples; five (5) sub samples of mistletoes were used for herbarium plants identification and phytochemical analysis. Moreover, the trees are; (Adonsonia digitta, Pilliostrigma thonningii, Ziziphus mauritiana, combretum glutinusum and sclerocarya birrea). The results obtained revealed that sample 1,2 and 3 are Tapinanthus globiferus while sample 4 and 5 were Tapinanthus oleiferus. Anti-nutritional content of the plants indicated, there were significant ($p<0.05$) differences in all the parameters, the results showed that, sponin was significantly ($p<0.005$) higher in sample (5) Ziziphus mauritiana (0.06mg/g), and sample (2) Adonsonia digitata was recorded with the lowest value (0.01mg/g). Phytate, was significantly ($p<0.05$) higher in sample (3) Sclerocarya birrea (101.25mg/g), sample (5) Ziziphus mauritiana (40.39mg/g) had significantly ($p<0.05$) lowest among the samples. Tanins varied significantly ($p<0.05$) higher in sample (4) Combretum glutinusum (3.02mg/g) while sample (3) Sclerocarya birrea (0.10mg/g) had the lowest value. Oxylates, was significantly ($p<0.05$) higher in sample (2) Adonsonia Digitata (110.14mg/g). Sample (4) Combretum glutinusum (33.82mg/g) has the lowest value among the samples. Therefore, mistletoe of Adonsonia digitata, has less anti-nutritional content, its more available and recommended for ruminant feeding.

Key words: Mistletoe; Browse plant; Ruminant animals; Anti- nutritional content; Semi-arid; and Samples.

INTRODUCTION

Ruminant animals constitute a very important part of the livestock sub-sector of the Nigerian agricultural economy. (Babandi *et al*., 2021). Browse plants have a great value in the extensive system of animal production in the arid and semi-arid regions. Amodu and Otaru (2004), reported that the time of new flush of most browse plants and shrubs starts long before the rains begin, while grass growth begins only with the rains. Browse plants therefore, provide high quality and palatable feed to livestock at a time when grass quality and biomass is minimal. Amodu and Otaru (2004), The unique characteristics of browse that have endeared them to livestock farmers lies in their ability to establish and grow fast, produce good leaf biomass, which remains green during the dry seasons when feed is scarce. Amodu and Otaru (2004), Livestock producers often seek for alternative feedstuffs to meet the demand for storage. (Babandi *et al*., 2021). At critical dry season available feed for grazing by animals are almost bare ground with poor vegetation cover and low biomass (Muhammad and Kallah, 2013). The animals are exposed to severe nutritional stress especially during the dry season when forages are scarce and of low quality (Lamidi *et al.,* 2010). This leads to weight loss, mortality, decreased in reproductive, performance and kid's mortality (Ahamefule, 2005). The nutritional constrains have necessitated concentrated efforts on innovative research geared towards cheaper and indigenous feed alternatives that would support the growth performance of ruminant animals during critical seasons (Bamikole *et al*., 2004).It is known that animals also consume the mistletoes during the feedstuff shortage in regions where conventional animal production is predominant. (Madibela *et al*., 2000) *Viscum* species (Mistletoes) can therefore, be alternative minerals and forage sources for ruminant feeding (Madibela *et al*., 2000). Mistletoe is a general term for woody shoot parasites in several plant families, especially in *Loranthaceae* and *Viscaceae* families (Ogunmefun *et al.,* 2013; Begho *et al.,* 2007). It is popularly called "Kauchi" and "ewe afomon" among the

Fulani and Yoruba speaking people of Nigeria, respectively (Saleh *et al.*, 2015). It is an obligate semi-parasitic evergreen tropical plant, normally found growing on a variety of trees, including palm fruit, mahogany and other tropical plants (Saleh *et al.*, 2015). Birds feed on the fruit of the plant and the undigested seeds from the bird droppings are spread on tree branches and thus germinate on the host plant (Adebisi *et al.*, 2013). Mistletoe is always produced by seed and cannot be cultivated in the soil like other plants, hence the ancients considered it to be an outgrowth of the tree. By rubbing the berries on the smooth bark of the underside of the branches of tree till they adhere, or inserting them in fissures made for this purpose, mistletoe could be grown quite successfully (Grieve, 2010). Therefore, the research investigated on the different varieties of tree plants and evaluation of its anti -nutritional content for ruminant animals feeding in semi-arid region of Nigeria.

MATERIALS AND METHODS

Description of the Study Area

The research was conducted in Jigawa State, located in Semi-arid region of Nigeria, Lies between coordinate 12.2280ºN, 9.5616ºE. The range of annual temperature and humidity is about 19-35 0C (max 42 0C) in the wet season and 13-33 0C (min 10 0C) in the dry season (JARDA, 2012).

DATA COLLECTION

The sample collection areas was on the basis of existence of ruminant animals, the plant was sorted in some selected local government areas of Jigawa State, (Three (3) Local Government Areas were selected from each of the three (3) geopolitical zones of the State, which include Dutse, Kiyawa, Miga, Guri, Malammadori, Kirikasamma, Ringim, Sule-Tankarkar and Babura Local Government Areas of Jigawa state. However, mistletoe samples were collected from five Multi-Purpose Tree Species (MPTS) from Nine (9) Local Government Areas of Jigawa State, making 45 samples. Five (5) sub samples of Mistletoes were used for chemical analysis. However, the trees are; (*Adonsonia digitta, Pilliostrigma thonningii, Ziziphus mauritiana, combretum glutinusum and sclerocarya birrea*). Mistletoe sample were identified in the department of botany, Bayero University, Kano. Mistletoe with less anti-nutritional content will be recommended for ruminant feeding.

DATA ANALYSIS

All Data collected were subjected to the analysis of variance (ANOVA) using procedure of statistical analysis system (SAS, 2003). Software package version (16) were significant differences observed between treatments, means were compared using Duncan multiple range test at 5% level of probability (Duncan, 1995).

Mistletoe herbarium plant identification

Plant identification involves five mistletoe plants representative samples from five (5) different multipurpose tree species (MTPS) were presented in Table 1. The results of identification indicated that, mistletoe plants were from the same kingdom – Plantea, order – Santaletes, family – Lorantacea and genus – *Tapinanthus* while in species, samples 1, 2 and 3 were all *Tapinanthus globiferus,* while samples 4 and 5 were from *Tapinanthus oleiferus* species. The common and local names of all the samples of mistletoes from the five (5) different multipurpose tree species (MPTS) were shown in Table 1.

Table 1: Herbarium Plant Identification

Samples	Kingdom	Order	Family	Genus	Species	Commom Names	Local names
1	Plantea	Santalales	Loranthaceae	Tapinanthus	*Tapinanthus globiferus*	Mistletoe of *Piliostigma thonningii*	Kaucin kargo
2	Plantea	Santalales	Loranthaceae	Tapinanthus	*Tapinanthus globiferus*	Mistletoe of *Adonsonia digitata*	Kaucin Kuka
3	Plantea	Santalales	Loranthaceae	Tapinanthus	*Tapinanthus globiferus*	Mistletoe of *Sclerocarya Birrea*	Kaucin danya
4	Plantea	Santalales	Loranthaceae	Tapinanthus	*Tapinanthus oleiferus*	Mistletoe of *Combratum Glotinusum*	Kaucin kattakara
5	Plantea	Santalales	Loranthaceae	Tapinanthus	*Tapinanthus oleiferus*	Mistletoe of *Zeziphus*	Kaucin magarya

Chemical Analysis

Phytochemical analysis of (tannin, saponins, oxalates and phytates) was carried out according to the procedure of El-Olenny *et al.,* (1994), and according to the AOAC (2019)

RESULT AND DISCUSSIONS

Result

The results of anti-nutritional contents of mistletoe were presented in Table 2. The result showed that there were significant ($p<0.05$) differences in all the parameters observed, the result indicate that, saponins was significantly ($p<0.005$) higher in sample (5) *Ziziphus mauritiana* (0.06mg/g). Followed by sample (4) *Combretum glutinusum* (0.03gm/g), sample (3) *Sclerocarya birrea* (0.02mg/g), sample (1) *Piliostigma thonningii* (0.02mg/g) and sample (2) *Adonsonia digitata* (0.01mg/g) was recorded with the lowest value. Phytates values was significantly ($p<0.05$) higher in sample (3) *Sclerocarya birrea* (101.25mg/g), sample (5) *Ziziphus mauritiana* (40.39mg/g) had significantly ($p<0.05$) lowest among the samples observed. Tanins varied significantly ($p<0.05$) higher in sample (4) *Combretum glotinusum* (3.02mg/g) while sample (3) *Sclerocarya birrea* (0.10mg/g) was the lowest value recorded. Oxylates, was significantly ($p<0.05$) higher in sample (2) *Adonsonia Digitata* (110.14mg/g). While value recorded for sample (4) *Combretum glutinusum* (33.82mg/g) has the lowest value among the samples observed.

Table 2. Anti-Nutritional contents of mistletoe plants

	Treatments					
Paremeters (mg/g)	S_1 (Pth)	S_2 (Ad)	S_3 (Sb)	S_4 (Cg)	S_5 (Zm)	SEM
Saponins	0.02^{ab}	0.01^{b}	0.02^{ab}	0.03^{ab}	0.06^{a}	0.01
Phytates	67.40^{b}	41.84^{d}	101.25^{a}	47.52^{c}	40.39^{d}	0.53
Tannins	2.77^{b}	1.86^{c}	0.10^{e}	3.02^{a}	1.79^{d}	0.01
Oxylates	44.12^{d}	110.14^{a}	54.15^{b}	33.32^{e}	45.68^{c}	0.360

Means within the same row with different subscript differs significantly ($P<0.05$), = Standerd error of means. S1 pth= (Sample 1 *Piliostigma thonningii)*, S2 Ad = (Sample 2 *Adonsonia digitata*), S3 Sb= (Sample3 *Sclerocarya berria*), S4 Sg (Sample 4= *Combretum glutinusum*), and S5 Zm (Sample 5= *Ziziphus mauritiana*).

Discussions

The result of plant identification of mistletoe indicates that, first three plant species were identified as *Tapinanthus globiferus* and other two plant species were *Tapinanthus oleiferus* as showed in Table 1. The anti-nutritional content values of the mistletoe of *Adonsonia digitata* (*Tapinanthus globiferus*) obtained in this study showed that the saponins and tannins content were lower than the values (3.25%, 9.90%) and for phytates and oxalates values obtained in this study were higher than that of (22.75%, 15.80%) reported by Anthony *et al*., (2017) for the evaluation of chemical composition of African mistletoe leaf meal as feed additive for broilers. Variations could be as a result of test materials used and time of sampling, another point of view is that Anthony *et al*., (2017) use only leaf while in this research use the whole plants. Therefore, the levels of anti-nutritional factors obtained in this study were less than or within the tolerable limits of 2%, regarded safe for ruminant feeding as described by Mcdowell *et al*., (1983), and mixing with other feed ingredients might probably lower the levels of the anti-nutritional factors.

CONCLUSION AND RECOMMENDATION

Based on the results of the present study, it can be concluded that; The results of identification indicated that, mistletoe plants were from the same kingdom – Plantea, order – Santaletes, family – Lorantacea and genus – *Tapinanthus* while in species, samples 1, 2 and 3 were all *Tapinanthus globiferus,* while samples 4 and 5 were from *Tapinanthus oleiferus* species. Anti-nutritive compositions of mistletoe of *Adonosonia digitata (Tapinanthus globiferus)* were less than 2% of the recommend level for small ruminant animals. This testified that mistletoe is a feed source for ruminant animal that can increase the profit of livestock owners when used, especially during feed shortage or dry season. However, it is recommended for the next author to continue with other parameters.

REFERENCES

Adebisi, F., Oluwaseye, A., Fausat, A., Michael, A., Adedayo, A.., Ikokoh, P., Salisu, A. and Chukwu N. (2013). Chemical characterization and antimicrobial activity of Loranthus micranthus Linn leaves.

Journal of medicinal plant research vol. 7(45), From 3332 to 3336, 3 December, 2013 DOI: 10.5897/JMPR2013.5283 Academic Journals http://www.academicjournals.org/JMR.

Ahamefule, F. O. (2005). Evaluation of pigeon pea-cassava peel-based diets for goat production in southeastern Nigeria. Ph.D dissertation. Michael Okpara University of Agriculture Umudike, Nigeria.

Amodu, J. T. and Otaru, S.M. (2004), production and utilization of browse plants. *In:* Gefu, J.O. and Amodu, J.T. (eds) Forage Production and Management in Nigeria. Proceedings of a training workshop on forage production and management held at NAPPRI, Shika 10-14 October 2004, From 23 to 27.

Anthony, D. Ologhobo, Esther Akangbo, Isaac Oluseun Adejumo, Richard Era and Babatunde Agboola (2017). Haematological and Histological evaluation of African mistletoe (*Viscum album*) leaf meal as feed additives for broilers. Annual Research and review in biology, animal biochemistry and nutrition research unit Department of Animal science, university of Ibadan, Nigeria. 15(3): 1-7, 2017; article no. ARRB.35042.

AOAC, (2019). Association of Official Analysis Chemists, Official methods of Analysis. 18th edition, AOAC Inc,Arlingon, Virginia USA. 1094

Babandi, B., Ashiru, R. M., Ibrahim, U., Gumel, I.A., Umar, Z., Salisu, N., Mustapha, Y., Danzabuwa, A. I., Isyaku. R., Ubayi, K. M., Shehu, B and Tajuddeen, I (2021) preliminary survey on mistletoe *(viscum album)* utilization in ruminants in some local governments of jigawa state, Nigeria. *Dutse Journal of Agriculture and Food Security* (DUJAFS) 8 (2): From 16 to 24

Bamikole, M. A., Akinsoyinu, A. O., Ezenwa, I., Babayemi, O. J., Akinlade, J., Adewumi, M.K. (2004). Effect of six-weekly harvest on the yield, chemical composition and dry matter degradability of *panicum maximum* and *stylsanthes hamate* in Nigeria. Grass Forage Science 59:357-163.

Begho, E.R., Omokhafa, K.O., Omo-ikerodah, E.E and Akpaja, E.O (2007). Some observations on the fruit set and incidence of mistletoe on rubber trees in Nigeria. *American-Eurasian journal of sustainable Agriculture*, 1(1): From 13 to 18, 2007.

Ducan, D. R. (1995). Multiple Range and multiple F-test. Biometrics. 11, From 1 to 4.

El-Olemy, M., Al-Mutadi, F. F and Afiji, A. A. (1994). Experimental Phyto chemistry: A laboratory manual. King Saud University Press ISBN-9960-05-051-3. From 21 to 61.

Grieve M. (2010). A modern Herbal, retrieved from http://www.botanical.com cited 28th October, 2010.

JARDA, (2012). Jigawa State Agricultural and Rural development Authority metrological Station Report: Temperature and Rainfall Record Book and management. From 1 to 2.

Lamidi, A. A., Aina A. B. J. and Sowande S. O. (2010). Nutrient digestibility and nitrogen balance in West African Dwarf goats fed blended diets for dry season production. Proceeding of 35th Conference of Nigerian Society for Animal Production 14th – 17th March, University of Ibadan 476.

Madibela, O. R. boitumelo, W. S., Letso, M. (2000). Chemical composition and in vitro dry matter digestibility f four parasitic plants (*Tapinnathus lugardu, Erianthenum ngamium. Viscum rotundifolium and viscum verrucosum*) in Botswana *Journal of Animal Feed Science and Technology 84* From, *97 to 106.*

McDowell, L. R., Corad, J. H., Ellis, G. I. and Loosli, J. K. (1983). Mineral requirements of grazing ruminants in tropical regions, Bulletin, C.T.A. University of Florida and the USAID. 69.

Muhammad, I. R. and Kallah, M. S. (2013).The need for establishment of grazing reserve and stock route commission.A position paper to Honourable members of House of Representative of the Federal republic of Nigeria, at the Public Hearing of the bill of an act to provide the "Establishment of a National Grazing Reserve and Stock Route and the Creation of a National Grazing Reserve Commision for managing National Grazing Route and Reserve in all parts of the Nation for incidental matters on Tuesday 4th June 2013 at the Speakers Conference Hall, House of Reps New Building. National Assembly Abuja".

Ogunmefun, O.T., Fasola, T.R., Saba A.B and Oridupa, O.A (2013). The Ethno botanical, Phyto-chemical and mineral analysis of *Phragmanthera incana* (Klotzsch); A Specie of Mistletoe Growing on Tree Plant Host in South-Western Nigeria. International Journal of Biomedical Science 9(1): From 33 to 40.

Saleh, I, Maigandi S.A., M.I. Hudu, Abubakar M.I. and A.U Shehu. (2015) Uses and Chemical composition of mistletoe (*Viscum album*) obtained from different species of trees. *Dutse Journal of Agriculture and food security volume 2 .1 008.*

SAS, (2003). Statistical Analysis System, Computer Software, SAS/STAT User's Guide Version 9. Statistical Analysis System Institute, Cary, North Carolina 27513, USA.